

# **ENERGY EFFICIENCY/RENEWABLE ENERGY IMPACT IN THE TEXAS EMISSIONS REDUCTION PLAN (TERP)**

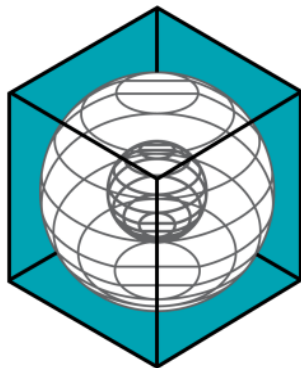
## **VOLUME I—SUMMARY REPORT**

**Annual Report to the  
Texas Commission on Environmental Quality  
January 2011-December 2011**



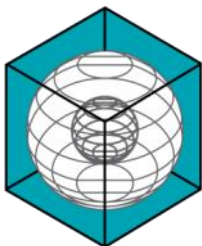
Jeff Haberl, Ph.D., P.E., Bahman Yazdani, P.E., Juan-Carlos Baltazar-Cervantes, Ph.D,  
Cynthia Lewis, Patrick Parker, Shirley Ellis, Jaya Mukhopadhyay, Hyojin Kim,  
Don Gilman, P.E., Larry Degelman, P.E., Gali Zilbertshtein, Ph.D, David Claridge, Ph.D., P.E.

December 2012



## **ENERGY SYSTEMS LABORATORY**

**Texas Engineering Experiment Station  
The Texas A&M University System**



**ENERGY SYSTEMS LABORATORY**

Texas Engineering Experiment Station  
The Texas A&M University System  
405 Harvey Mitchell Parkway, South  
College Station, Texas 77843-3581

December 31, 2012

Chairman Bryan W. Shaw  
Texas Commission on Environmental Quality  
P. O. Box 13087  
Austin, TX 78711-3087

Dear Chairman Shaw:

The Energy Systems Laboratory (Laboratory) at the Texas Engineering Experiment Station of The Texas A&M University System is pleased to provide its ninth annual report, "Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP)," as required under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002 (Senate Bill 5, 77R as amended 78 R & 78S).

The Laboratory is required to annually report the energy savings from statewide adoption of the Texas Building Energy Performance Standards in Senate Bill 5 (SB 5), as amended, and the relative impact of proposed local energy code amendments in the Texas non-attainment and near-non-attainment counties as part of the Texas Emissions Reduction Plan (TERP).

Please contact me at (979) 845-1280 should you or any of the TCEQ staff have any questions concerning this report or any of the work presently being done to quantify emissions reduction from energy efficiency and renewable energy measures as a result of the TERP implementation.

Sincerely,

A handwritten signature in black ink, reading "David E. Claridge".

David E. Claridge, Ph.D., P.E.  
Director

Enclosure

cc: Commissioner Toby Baker  
Commissioner Carlos Rubinstein  
Executive Director Zak Covar

### **Disclaimer**

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## VOLUME I – SUMMARY REPORT

### Energy Efficiency/Renewable Energy Impact In The Texas Emissions Reduction Plan

#### Executive Summary

The Energy Systems Laboratory (Laboratory), at the Texas Engineering Experiment Station of The Texas A&M University System, in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002, submits its ninth annual report, Energy Efficiency/Renewable Energy (EE/RE) Impact in the Texas Emissions Reduction Plan (TERP) to the Texas Commission on Environmental Quality.

The report is organized in three volumes.

- Volume I – Summary Report – provides an executive summary and overview;
- Volume II – Technical Report – provides a detailed report of activities, methodologies and findings;
- Volume III – Technical Appendix – contains detailed data from simulations for each of the counties included in the analysis.

#### Accomplishments:

##### 1. Energy Code Amendments

The Laboratory was requested by several Councils of Governments (COGs) and municipalities to analyze the stringency of several proposed residential and commercial energy code amendments, including: the 2003 and 2006 IECC and the ASHRAE Standards 90.1-2001 and 90.1-2004. Results of the analysis are included in this Volume II-Technical Report.

##### 2. Technical Assistance

The Laboratory provided technical assistance to the TCEQ, PUCT, SECO, ERCOT, and several political subdivisions, as well as stakeholders participating in improving the compliance of the Texas Building Energy Performance Standards (TBEPS). The Laboratory also worked closely with the TCEQ to refine the integrated NOx emissions reduction calculation procedures that provide the TCEQ with a standardized, creditable NOx emissions reduction from energy efficiency and renewable energy (EE/RE) programs, which are acceptable to the US EPA. These activities have improved the accuracy of the creditable NOx emissions reduction from EE/RE initiatives contained in the TERP and have assisted the TCEQ, local governments, and the building industry with effective, standardized implementation and reporting.

##### 3. NOx Emissions Reduction

Under the TERP legislation, the Laboratory must determine the energy savings from energy code adoption and, when applicable, from more stringent local codes or above-code performance ratings, and must report these reductions annually to the TCEQ.

Figure 1 shows the integrated NOx emissions reduction through 2020 for the electricity and natural gas savings from the various EE/RE programs.

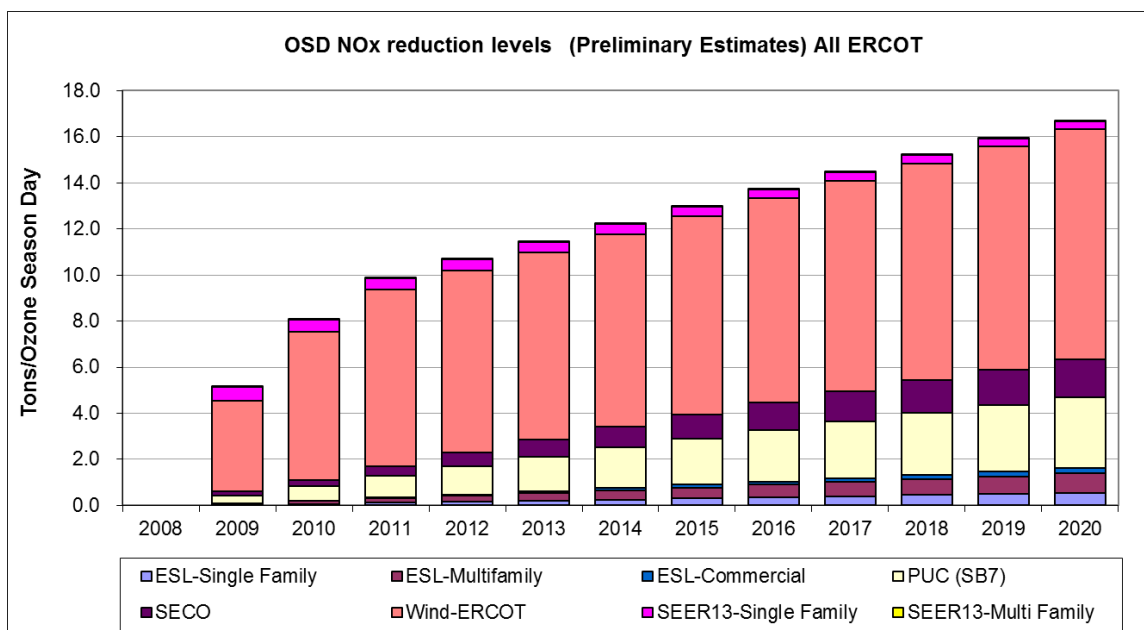


Figure 1: Integrated OSD NOx Emissions Reduction Projections through 2020 (Base Year 2008)

In 2011 (see *Table I*), the total integrated annual savings from all programs is 13,354,918 MWh/year. The integrated annual electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction is 315,876 MWh/year (2.4% of the total electricity savings),
- Savings from the PUC's Senate Bill 7 program is 1,197,953 MWh/year (9.0%),
- Savings from SECO's Senate Bill 5 program is 509,616 MWh/year (3.8%),
- Electricity savings from green power purchases (wind) is 10,995,427 MWh/year (82.3%), and
- Savings from residential air conditioner retrofits<sup>1</sup> is 336,046 MWh/year (2.5%)

In 2011, the total integrated OSD savings from all programs is 36,076 MWh/day, which would be a 1,503 MW average hourly load reduction during the OSD period. The integrated OSD electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction is 1,361 MWh/day (3.8%),
- Savings from the PUC's Senate Bill 7 programs is 3,282 MWh/day (9.1%),
- Savings from SECO's Senate Bill 5 program is 1,396 MWh/day (3.9%),
- Electricity savings from green power purchases (wind) are 27,654 MWh/day (76.7%), and
- Savings from residential air conditioner retrofits are 2,383 MWh/day (6.6%).

By 2013, the total integrated annual savings from all programs will be 15,391,293 MWh/year. The integrated annual electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction will be 597,699 MWh/year (3.9% of the total electricity savings),
- Savings from the PUC's Senate Bill 7 programs will be 1,908,944 MWh/year (12.4%),
- Savings from SECO's Senate Bill 5 program will be 909,903 MWh/year (5.9%),
- Electricity savings from green power purchases (wind) will be 11,671,466 MWh/year (75.8%), and
- Savings from residential air conditioner retrofits is 303,281 MWh/year (2.0%).

<sup>1</sup> This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.

By 2013, the total integrated OSD savings from all programs is 41,691 MWh/day, which would be a 1,737 MW average hourly load reduction during the OSD period. The integrated OSD electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction is 2,462 MWh/day (5.9%),
- Savings from the PUC's Senate Bill 7 programs is 5,230 MWh/day (12.5%),
- Savings from SECO's Senate Bill 5 program is 2,493 MWh/day (6.0%),
- Electricity savings from green power purchases (wind) are 29,355 MWh/day (70.4%), and
- Savings from residential air conditioner retrofits are 2,151 MWh/day (5.2%).

In 2011 (Table 2), the total integrated annual NOx emissions reduction from all programs is 3,723 tons-NOx/year. The integrated annual NOx emissions reduction<sup>2</sup> from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction is 80 tons-NOx/year (2.1% of the total NOx savings),
- NOx emissions reduction from the PUC's Senate Bill 7 programs is 340 tons-NOx/year (9.1%),
- NOx emissions reduction from SECO's Senate Bill 5 program is 162 tons-NOx/year (4.4%),
- NOx emissions reduction from green power purchases (wind) is 3,062 tons-NOx/year (82.2%), and
- NOx emissions reduction from residential air conditioner retrofits is 79 tons-NOx/year (2.1%).

In 2011, the total integrated OSD NOx emissions reduction from all programs is 9.89 tons-NOx/day. The integrated OSD NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction is 0.34 tons-NOx/day (3.4%),
- NOx emissions reduction from the PUC's Senate Bill 7 programs is 0.93 tons-NOx/day (9.4%),
- NOx emissions reduction from SECO's Senate Bill 5 program is 0.44 tons-NOx/day (4.4%),
- NOx emissions reduction from green power purchases (wind) are 7.63 tons-NOx/day (77.1%), and
- NOx emissions reduction from residential air conditioner retrofits are 0.55 tons-NOx/day (5.6%).

By 2013, the total integrated annual NOx emissions reduction from all programs will be 4,296 tons-NOx/year. The integrated annual NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction will be 150 tons-NOx/year (3.5% of the total NOx savings),
- NOx emissions reduction from the PUC's Senate Bill 7 programs will be 547 tons-NOx/year (12.7%),
- NOx emissions reduction from SECO's Senate Bill 5 program will be 277 tons-NOx/year (6.4%),
- NOx emissions reduction from green power purchases (wind) will be 3,250 tons-NOx/year (75.7%), and
- NOx emissions reduction from residential air conditioner retrofits will be 72 tons-NOx/year (1.7%).

By 2013, the total integrated OSD NOx emissions reduction from all programs is 11.48 tons-NOx/day. The integrated OSD NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction will be 0.62 tons-NOx/day (5.4%),
- NOx emissions reduction from the PUC's Senate Bill 7 programs will be 1.50 tons-NOx/day (13.1%),
- NOx emissions reduction from SECO's Senate Bill 5 program will be 0.76 tons-NOx/day (6.6%),
- NOx emissions reduction from green power purchases (wind) will be 8.10 tons-NOx/day (70.6%), and
- NOx emissions reduction from residential air conditioner retrofits will be 0.50 tons-NOx/day (4.4%).

<sup>2</sup> These NOx emissions reductions were calculated with the US EPA's 2010 eGRID for annual (25% capacity factor).

Table 1: Annual and OSD Electricity Savings for the Different Programs (Base Year 2008)

PROGRAM	ANNUAL												
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family (MWh)	0	21,748	55,268	93,760	132,768	172,325	212,462	253,214	294,613	336,694	379,492	423,044	467,388
ESL-Multifamily (MWh)	0	50,218	94,867	167,566	239,960	312,072	383,927	455,547	526,957	598,177	669,233	740,146	810,939
ESL-Commercial (MWh)	0	0	25,750	54,550	83,726	113,302	143,303	173,752	204,674	236,097	268,045	300,545	333,627
PUC (SB7) (MWh)	0	449,034	814,153	1,197,953	1,562,564	1,908,944	2,238,004	2,550,612	2,847,590	3,129,718	3,397,740	3,652,361	3,894,251
SECO (MWh)	0	235,216	293,537	509,616	714,891	909,903	1,095,163	1,271,161	1,438,359	1,597,197	1,748,093	1,891,444	2,027,628
Wind-ERCOT (MWh)	0	3,273,150	8,135,429	10,995,427	11,328,405	11,671,466	12,024,917	12,389,071	12,764,253	13,150,797	13,549,046	13,959,356	14,382,092
SEER13-Single Family (MWh)	0	343,330	326,163	309,855	294,362	279,644	265,662	252,379	239,760	227,772	216,383	205,564	195,286
SEER13-Multifamily (MWh)	0	29,021	27,569	26,191	24,881	23,637	22,456	21,333	20,266	19,253	18,290	17,376	16,507
<b>Total Annual (MWh)</b>	<b>0</b>	<b>4,401,717</b>	<b>9,772,736</b>	<b>13,354,918</b>	<b>14,381,557</b>	<b>15,391,293</b>	<b>16,385,894</b>	<b>17,367,069</b>	<b>18,336,472</b>	<b>19,295,705</b>	<b>20,246,322</b>	<b>21,189,836</b>	<b>22,127,718</b>

PROGRAM	OZONE SEASON DAY - OSD												
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family (MWh)	0	124	283	468	655	844	1,037	1,232	1,431	1,633	1,838	2,047	2,259
ESL-Multifamily (MWh)	0	233	460	744	1,027	1,308	1,589	1,869	2,148	2,426	2,704	2,981	3,258
ESL-Commercial (MWh)	0	0	71	149	229	310	393	476	561	647	734	823	914
PUC (SB7) (MWh)	0	1,230	2,231	3,282	4,281	5,230	6,132	6,988	7,802	8,575	9,309	10,006	10,669
SECO (MWh)	0	644	804	1,396	1,959	2,493	3,000	3,483	3,941	4,376	4,789	5,182	5,555
Wind-ERCOT (MWh)	0	14,246	23,054	27,654	28,492	29,355	30,244	31,160	32,103	33,075	34,077	35,109	36,172
SEER13-Single Family (MWh)	0	2,445	2,323	2,207	2,097	1,992	1,892	1,798	1,708	1,622	1,541	1,464	1,391
SEER13-Multifamily (MWh)	0	195	186	176	167	159	151	144	136	130	123	117	111
<b>Total OSD (MWh)</b>	<b>0</b>	<b>19,117</b>	<b>29,412</b>	<b>36,076</b>	<b>38,907</b>	<b>41,691</b>	<b>44,438</b>	<b>47,150</b>	<b>49,830</b>	<b>52,484</b>	<b>55,115</b>	<b>57,729</b>	<b>60,329</b>

Table 2: Annual and OSD NOx Emissions Reduction Values for the Different Programs (Base Year 2008)

PROGRAM	ANNUAL (in tons NOx)												
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family	0	5	14	23	33	42	52	62	72	83	93	104	115
ESL-Multifamily	0	13	24	43	61	80	98	117	135	153	171	190	208
ESL-Commercial	0	0	6	14	21	28	36	43	51	59	67	75	83
PUC (SB7)	0	126	229	340	447	547	643	734	821	903	981	1,055	1,125
SECO	0	67	99	162	221	277	330	381	429	475	518	559	599
Wind-ERCOT	0	893	2,268	3,062	3,154	3,250	3,348	3,450	3,554	3,662	3,773	3,887	4,005
SEER13-Single Family	0	81	77	73	69	66	62	59	56	53	51	48	46
SEER13-Multifamily	0	7	6	6	6	6	5	5	5	5	4	4	4
<b>Total Annual (Tons NOx)</b>	<b>0</b>	<b>1,192</b>	<b>2,723</b>	<b>3,723</b>	<b>4,012</b>	<b>4,296</b>	<b>4,574</b>	<b>4,851</b>	<b>5,123</b>	<b>5,393</b>	<b>5,658</b>	<b>5,922</b>	<b>6,185</b>

PROGRAM	OZONE SEASON DAY - OSD (in tons NOx/day)												
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESL-Single Family	0.00	0.03	0.07	0.11	0.16	0.21	0.25	0.30	0.35	0.40	0.45	0.50	0.55
ESL-Multifamily	0.00	0.06	0.12	0.19	0.26	0.33	0.41	0.48	0.55	0.62	0.69	0.76	0.83
ESL-Commercial	0.00	0.00	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.23
PUC (SB7)	0.00	0.35	0.63	0.93	1.22	1.50	1.76	2.01	2.25	2.47	2.69	2.89	3.08
SECO	0.00	0.18	0.27	0.44	0.60	0.76	0.90	1.04	1.18	1.30	1.42	1.53	1.64
Wind-ERCOT	0.00	3.94	6.42	7.63	7.87	8.10	8.35	8.60	8.86	9.13	9.41	9.69	9.99
SEER13-Single Family	0.00	0.57	0.54	0.51	0.49	0.46	0.44	0.42	0.40	0.38	0.36	0.34	0.32
SEER13-Multifamily	0.00	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03
<b>Total OSD (Tons NOx)</b>	<b>0.00</b>	<b>5.18</b>	<b>8.11</b>	<b>9.89</b>	<b>10.70</b>	<b>11.48</b>	<b>12.25</b>	<b>13.00</b>	<b>13.76</b>	<b>14.49</b>	<b>15.23</b>	<b>15.94</b>	<b>16.67</b>

#### 4. Technology Transfer

The Laboratory, along with the TCEQ, hosts the annual Clean Air Through Energy Efficiency (CATEE) conference, which is attended by top experts and policy makers in Texas and from around the country. At the conference, the latest educational programs and technology is presented and discussed, including efforts by the Laboratory, and others, to reduce air pollution in Texas through energy efficiency and renewable energy. These efforts have produced significant success in bringing EE/RE closer to US EPA acceptance in the Texas SIP. The Laboratory will continue to provide superior technology to the State of Texas through such efforts with the TCEQ and the US EPA.

To accelerate the transfer of technology developed as part of the TERP, the Laboratory has also made presentations at national, state and local meetings and conferences, which includes the publication of peer-reviewed papers. The Laboratory will continue to provide technical assistance to the TCEQ, counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air quality for all Texans.

These efforts have been recognized nationally by the US EPA. In 2007, the Laboratory was awarded a National Center of Excellence on Displaced Emissions Reduction (CEDER) by the US EPA so that these accomplishments could be rapidly disseminated to other states for their use. The benefits of CEDER include:

- Reducing the financial, technical, and administrative costs of determining the emissions reduction from EE/RE measures;
- Continuing to accelerate implementation of EE/RE strategies as a viable clean air effort in Texas and other states;
- Helping other states better identify and prioritize cost-effective clean air strategies from EE/RE; and
- Communicating the results of quantification efforts through case-studies and a clearinghouse of information.

### Acknowledgements

This work has been completed as a fulfillment of the requirements in Texas Health Code, Senate Bill 5, Section 388.003, and through Senate Bill 20, House Bill 2481 and House Bill 2129, which requires the Laboratory to assist TCEQ in quantifying emissions reductions credits from energy efficiency and renewable energy programs, through a contract with the Texas Environmental Research Consortium (TERC). Similarly, selected Code training workshops were funded by the US DOE through the Texas State Energy Conservation Office (SECO). Partial funding on the Texas Climate Vision project, a joint project with the City of Austin was also provided by the US DOE through SECO.

The authors are also grateful for the timely input provided by the following individuals, and agencies: Mr. Art Diem, US EPA, for providing the eGRID database and Vincent Meiller and Robert Gifford, TCEQ.

Numerous additional individuals at the Laboratory contributed significantly to this report, including Sung Lok Do, Kee Han Kim, Stephen O'Neal, Rose Sauser and Ivonne Macouzet.



## VOLUME I – SUMMARY REPORT

### Energy Efficiency/Renewable Energy Impact In The Texas Emissions Reduction Plan

#### Overview

The Energy Systems Laboratory (Laboratory), at the Texas Engineering Experiment Station of the Texas A&M University System, is pleased to provide our ninth annual report, Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP), to the Texas Commission on Environmental Quality (TCEQ) in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002. This annual report:

- Provides an estimate of the energy savings and NOx reductions from energy code compliance in new residential construction in all ERCOT counties;
- Provides an estimate of the standardized, cumulative, integrated energy savings and NOx reductions from the TERP programs implemented by the Laboratory, SECO, the PUC and ERCOT in all ERCOT Texas;
- Describes the technology developed to enable the TCEQ to substantiate energy and emissions reduction credits from energy efficiency and renewable energy initiatives (EE/RE) to the U.S. Environmental Protection Agency (US EPA), including the development of a web-based emissions reduction calculator; and
- Outlines progress in advancing EE/RE strategies for credit in the Texas State Implementation Plan (SIP).

The report is organized in three volumes.

Volume I – Summary Report – provides an executive summary and overview;

Volume II – Technical Report – provides a detailed report of activities, methodologies and findings; and

Volume III – Technical Appendix – contains detailed data from code-compliant energy simulations for all ERCOT counties in Texas included in the analysis.

#### Legislative Background

The TERP was established in 2001 by the 77<sup>th</sup> Legislature through the enactment of Senate Bill 5 to:

- Ensure that Texas air meets the Federal Clean Air Act requirements (Section 707, Title 42, United States Code); and
- Reduce NOx emissions in non-attainment and near-non-attainment counties through mandatory and voluntary programs, including the implementation of energy efficiency and renewable energy programs (EE/RE).

To achieve the clean air and emissions reduction goals of the TERP, Senate Bill 5 created a number of EE/RE programs for credit in the SIP:

- The Texas Building Energy Performance Standards (TBEPS) as the building energy code for all new residential and commercial buildings;
- A municipality or county may request the Laboratory to determine the energy impact of proposed energy code changes;
- An annual evaluation by the Public Utility Commission of Texas (PUCT), in cooperation with the Laboratory, of the emissions reduction of energy demand, peak electric loads and the associated air contaminant reductions from utility-sponsored programs established under Senate Bill 5, and utility-sponsored programs established under the electric utility restructuring act (Section 39.905 Utilities Code);
- A 5% electricity reduction goal each year for facilities of political subdivisions in non-attainment and near-non-attainment counties from 2002 through 2009; and
- Annual report to TCEQ to be provided by the Laboratory on the energy savings and resultant emissions reduction from implementation of building energy codes and which identifies the municipalities and counties whose codes are more or less stringent than the un-amended code.

Passed during the 78<sup>th</sup> Legislature (2003), HB 1365 and HB 3235 amended TERP to enhance its effectiveness with these additional energy efficiency initiatives:

- TCEQ is required to conduct outreach to non-attainment and near-non-attainment counties on the benefits of implementing energy efficiency measures as a way to meet the air quality goals under the federal Clean Air Act;
- TCEQ is required develop a methodology for computing emissions reduction from energy efficiency initiatives;
- A voluntary Energy-Efficient Building Program at the General Land Office (GLO), in consultation with the Laboratory, for the accreditation of buildings that exceed the state energy code requirements by 15% or more;
- Municipalities are allowed to adopt an optional, alternate energy code compliance mechanism through the use of accredited energy efficiency programs determined to be code-compliant by the Laboratory, as well as the US EPA's Energy Star New Homes program; and
- The Laboratory is required to develop and administer a statewide training program for municipal building inspectors seeking to become code-certified inspectors for enforcement of energy codes.

Senate Bill 5 was again amended during the 79<sup>th</sup> Legislature (2005) through SB 20, HB 2481 and HB 2129. These enhanced the effectiveness of Senate Bill 5 by adding the following energy efficiency initiatives:

- 5,880 MW of generating capacity is required from renewable energy technologies by 2015;
- 500 MW from non-wind renewables;
- The PUCT is required to establish a target of 10,000 megawatts of installed renewable capacity by 2025;
- The TCEQ is required to develop methodology for computing emissions reduction from renewable energy initiatives and the associated credits;
- The Laboratory is required to assist the TCEQ in quantifying emissions reduction credits from energy efficiency and renewable energy programs;
- The Texas Environmental Research Consortium (TERC) is required to contract with the Laboratory to develop and annually calculate creditable emissions reduction from wind and other renewable energy resources for the state's SIP; and
- The Laboratory is required to develop at least three alternative methods for achieving a 15 % greater potential energy savings in residential, commercial and industrial construction.

The 80<sup>th</sup> Legislature (2007), through SB 12, and HB 3693 further amended Senate Bill 5 to enhance its effectiveness by adding the following energy efficiency initiatives:

- The Laboratory is required to provide written recommendations to the State Energy Conservation Office (SECO) about whether or not the energy efficiency provisions of latest published edition of the International Residential Code (IRC) or the International Energy Conservation Code (IECC) are equivalent to or better than the energy efficiency and air quality achievable under the editions adopted under the 2001 IRC/IECC. The Laboratory shall make its recommendations no later than six months after publication of new editions at the end of each three-year code development cycle of the International Residential Code and the International Energy Conservation Code.
- The Laboratory is required to consider comments made by persons who have an interest in the adoption of the energy codes in the recommendations made to SECO.
- The Laboratory is required to develop a standardized report format to be used by providers of home energy ratings, including different report formats for rating newly constructed residences from those for existing residences. The form must be designed to give potential buyers information on a structure's energy performance, including: insulation; types of windows; heating and cooling equipment; water heating equipment; additional energy conserving features, if any; results of performance measurements of building tightness and forced air distribution; and an overall rating of probable energy efficiency relative to the minimum requirements of the International Energy Conservation Code or the energy efficiency chapter of the International Residential Code, as appropriate.
- The Laboratory is encouraged to cooperate with an industry organization or trade association to: develop guidelines for home energy ratings; provide training for individuals performing home

energy ratings and providers of home energy ratings; and provide a registry of completed ratings for newly constructed residences and residential improvement projects for the purpose of computing the energy savings and emissions reduction benefits of the home energy ratings program.

- The Laboratory is required to include information on the benefits attained from this program in an annual report to the commission.

The 81<sup>st</sup> Legislature (2009) extended the date of the TERP to 2019 and required the TCEQ to contract with Laboratory to compute emissions reduction from wind and other renewable energy resources for the SIP.

The 82<sup>nd</sup> Legislature (2011) has cut 50% of the Laboratory's funding under TERP (to take into effect in FY 2012), while the Laboratory's responsibilities under TERP increased, as new energy efficiency initiatives were introduced:

- Each political subdivision, institution of higher education or state agency shall establish a goal to reduce the electric consumption by the entity by at least 5% each state fiscal year for 10 years, beginning September 1, 2011. Each entity annually shall report to SECO, on forms provided by SECO, regarding the entity's goal, the entity's efforts to meet the goal, and progress the entity has made. The Laboratory is required to calculate energy savings and emissions reduction for each political subdivision, institution of higher education or state agency, based on the information collected by SECO.
- Beginning April 1, 2012, all electric cooperatives that had retail sales of more than 500,000 MWh in 2005 and all municipally owned utilities must report each year to SECO, on a standardized form developed by SECO, information regarding the combined effects of the energy efficiency activities of the electric cooperative/utility from the previous calendar year, including the annual goals, programs enacted to achieve those goals, and any achieved energy demand or savings goals. The Laboratory is required to calculate energy savings and emissions reduction for municipally owned utilities and for electric cooperatives, based on the information collected by SECO.
- SECO is required to appoint a new advisory committee for selecting high-performance building design evaluation systems. The Laboratory will send a representative to participate at the new advisory committee.
- The Legislature is allowed to conduct outreach to the real estate industry on the value of energy code compliance and above code construction.

### **Laboratory Funding for the TERP**

The Laboratory expended \$181,855 in FY 2002; \$372,226 in FY 2003; \$635,683.84 in FY 2004; \$1,107,366.13 in FY 2005; \$952,012.70 in 2006; \$947,114.62 in FY 2007; \$908,512.65 in FY 2008; \$949,927.94 in FY 2009; \$902,843.35 in FY2010. In FY 2011 the Laboratory expended \$853,421.69. The Laboratory has also supplemented these funds with competitively awarded Federal and State grants to provide the needed statewide training for the new mandatory energy codes and to provide technical assistance to cities and counties in helping them implement adoption of the legislated energy efficiency codes. In addition, the ESL received an award from the US EPA in the spring of 2007 to establish a Center of Excellence for the Determination of Emissions Reduction (CEDER) which has helped to enhance the EE/RE emissions calculations.

### **Accomplishments since January 2011**

Since January 2011, the Laboratory has accomplished the following:

- Calculated energy and resultant NOx reductions from implementation of the Texas Building Energy Performance Standards (IECC/IRC codes) to new residential and commercial construction for all non-attainment and near-non-attainment counties;
- Enhanced the Laboratory's IECC/IRC Code-Traceable Test Suite for determining emissions reduction due to code and above-code programs;
- Enhanced the IC3 calculator, which is energy code compliance software based on the Texas Building Energy Performance Standards by resolving minor defects found in the model, introducing new capability to add slab and floor insulation to IC3 interface, and updating manual and illustrations;

- Continued development and testing of key procedures for validating simulations of building energy performance;
- Provided energy code training workshops, including: residential, commercial IECC/IRC energy code training sessions, code-compliant software sessions throughout the State of Texas;
- Maintained and updated the Laboratory's Texas Emissions Reduction Plan (TERP) website;
- Maintained a builder's residential energy code Self-Certification Form (Ver.1.3) for use by builders outside municipalities;
- Analyzed the stringency of several residential and commercial energy codes, including the 2009 IECC, 2009 IRC and ASHRAE Standard 90.1 2007;
- Reviewed several local code proposed amendments and analyzed their stringency. For: the City of Houston and the City of Austin.
- Hosted the Clean Air Through Energy Efficiency (CATEE) Conference in November 2011 in Dallas, Texas. Conference sessions included key talks by the TCEQ, EPA, DOE and the Laboratory about quantifying emissions reduction from EE/RE opportunities and guidance on key energy efficiency and renewable energy topics;
- Provided technical assistance to the TCEQ regarding specific issues, including:
  - Enhancement of the standardized, integrated NOx emissions reduction reporting procedures to the TCEQ for EE/RE projects;
  - Enhancement of the procedures for weather normalizing NOx emissions reduction from renewable projects;
- Enhanced the web-based emissions reduction calculator, including:
  - Continued the enhancement of the new computer architecture to allow for synchronous calculations, user accounts, and code-compliance;
- Developed 15% above code recommendations for residential buildings;
- Participated as exhibitors at several conferences, including the Clean Air Through Energy Efficiency Conference in Dallas, Texas and the Texas Green Home Summit in Los Colinas, Texas.
- Performed a study for the City of Arlington on the economic and environmental impacts of potential energy code enhancements for the city. The project identified up to 16 Energy Efficiency Measures (EEMs) for various building energy components (e.g., windows, doors, insulation; lighting; HVAC; and domestic water heating). Combinations of EEMs were used to deliver 15% above the energy code stringency. The study and recommendations included both residential and commercial new development and existing building inventory (as an option).
- Continued the development of verification procedures, including:
  - Worked toward the code compliance tools for commercial buildings, retail and school buildings.

### Technology Transfer

To accelerate the transfer of technology developed as part of the TERP program, the Laboratory:

- Delivered "Statewide Air Emissions Calculations from Wind and Other Renewables," to the Texas Commission on Environmental Quality in December 2011.
- Updated previously developed degradation analysis to determine if degradation could be observed in the measured power from Texas wind farms.
- Updated previously developed database of other renewable projects in Texas, including: solar photovoltaic, geothermal, hydroelectric, and Landfill Gas-fired Power Plants.
- Applied previously developed estimation techniques for hourly solar radiation from limited data sets.
- Worked with the EPA and TCEQ and developed a new version of eGRID for all ERCOT counties in Texas.
- Along with the TCEQ and the US EPA, is host to the annual Clean Air Through Energy Efficiency (CATEE) Conference attended by top Texas experts and policy makers and national experts.
- Continued the National Center of Excellence on Displaced Emissions Reduction (CEDER) by the US EPA. The benefits of CEDER include:
  - Reducing the financial, technical, and administrative costs of determining the emissions reduction from EE/RE measures;

- Continuing to accelerate implementation of EE/RE strategies as a viable clean air effort in Texas and other states;
- Helping other states identify and prioritize cost-effective clean air strategies from EE/RE, and;
- Communicating the results of quantification efforts through case-studies and a clearinghouse of information.

In addition to the tasks listed above, the Laboratory delivered presentations regarding the TERP related work, including:

- Presentations to the North Texas Chapter, May 2011 and June 2011
- Presentations to the Building Official Association of Texas, August 2011
- Presentations to the City of Arlington, August 2011 and October 2011
- Presentations to the Sierra Club, Houston and El Paso, Texas, October 2011
- Presentations to the International Conference for Enhanced Building Operations, New York City, New York, October 2011
- Presentations to the Clean Air Through Energy Efficiency Conference, Dallas, Texas, November 2011
- Presentation to the Texas Green Home Summit, Irving, Texas, 2011
- Presentation to the Central Texas Council of Governments, 2011

Four presentations to the City of Arlington

- Mukhopadhyay, J.; Kim, H.; Do, S.L.; Kim, K.H.; Baltazar, J.-C.; Haberl, J.; Lewis, C. 2011 “Cost-Effective Energy Efficiency Measures for Above Code (ASHRAE 90.1-2001 and 2007) Restaurant Buildings in the City of Arlington,” City of Arlington and Stakeholders, August and October 2011
- Kim, H.; Do, S.L.; Baltazar, J.-C.; Haberl, J.; Lewis, C. 2011 “Cost-Effective Energy Efficiency Measures for Above Code (2003 and 2009 IECC) Residential Buildings in the City of Arlington,” City of Arlington and Stakeholders, August and October 2011
- Kim, H.; Do, S.L.; Kim, K.H.; Baltazar, J.-C.; Haberl, J.; Lewis, C. 2011 “Cost-Effective Energy Efficiency Measures for Above Code (ASHRAE 90.1-2001 and 2007) Small Retail Buildings in the City of Arlington,” City of Arlington and Stakeholders, August and October 2011
- Mukhopadhyay, J.; Kim, H.; Do, S.L.; Kim, K.H.; Baltazar, J.-C.; Haberl, J.; Lewis, C. 2011 “Cost-Effective Energy Efficiency Measures for Above Code (ASHRAE 90.1-2001 and 2007) Small Restaurant Buildings in the City of Arlington,” City of Arlington and Stakeholders, August and October 2011

Presentation of four papers at the 11<sup>th</sup> International Conference for Enhanced Building Operations, held in New York City, New York, October 2011.

- Kim, H.; Baltazar, J.C.; Haberl, J.; Lewis, C.; Yazdani, B. 2011 “Statewide Electricity and Demand Capacity Savings from the Implementation of IECC Code in Texas: Analysis for Single-Family Residences,” *Proceedings of the 11<sup>th</sup> International Conference for Enhanced Building Operations*, New York City, New York
- Mukhopadhyay, J.; Baltazar, J.C.; Kim, H.; Haberl, J. 2011 “Comparison of ASHRAE Standard 90.1, 189.1 and IECC Codes for Large Office Buildings in Texas”, *Proceedings of the Eleventh International Conference for Enhanced Building Operations*, New York City, New York
- Kim, H.; Baltazar, J.C.; Haberl, J.; Lewis, C.; Yazdani, B. 2011 “Energy Savings and Persistence From an Energy Services Performance Contract at an Army Base,” *Proceedings of the 11<sup>th</sup> International Conference for Enhanced Building Operations*, New York City, New York
- Kim, H.; Baltazar, J.C.; Haberl, J.; Lewis, C.; Yazdani, B. 2011 “Cost-Effective Energy Efficiency Measures for 15% Above 2009 IECC Code-Compliant House for Residential Buildings in TX,” *Proceedings of the 11<sup>th</sup> International Conference for Enhanced Building Operations*, New York City, New York

Two presentations to the Clean Air Through Energy Efficiency Conference held in Dallas, Texas, November 2011.

- Kim, H.; Haberl, J.; Baltazar, J-C.; Mukhopadhyay, J.; Do, S.L.; Kim, K.H.; Lewis, C.; Yazdani, B.; 2011 “Energy Efficiency/Renewable Energy (EE/RE) Measures for K-12 Schools in Texas,” *Clean Air Through Energy Efficiency Conference*, Dallas, Texas, November 2012
- Haberl, J.; Yazdani, B.; Culp, C., 2011 “Texas Emissions Reductions Program (TERP) Energy Efficiency/Renewable Energy (EE/RE) Update,” *Clean Air Through Energy Efficiency Conference*, Dallas, Texas, November 2012

One presentation to the *Lowering School Energy Bills* Workshop at the Clean Air Through Energy Efficiency Conference held in Dallas, Texas November 2011

The Laboratory has and will continue to provide leading-edge technical assistance to the TCEQ, counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air quality for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP. These activities were designed to more accurately calculate the creditable NO<sub>x</sub> emissions reduction from EE/RE initiatives contained in the TERP and to assist the TCEQ, local governments, and the building industry with standardized, effective implementation and reporting.

### **Energy and NO<sub>x</sub> Reductions from New Residential and Commercial Construction, Including Residential Air Conditioner Retrofits**

State adoption of the energy efficiency provisions of the International Residential Code (IRC) and International Energy Conservation Code (IECC) became effective September 1, 2001. The Laboratory has developed and delivered training to assist municipal inspectors to become certified energy inspectors. The Laboratory also supported code officials with guidance on interpretations as needed. This effort, based on a requirement of HB 3235, 78<sup>th</sup> Texas Legislature, supports a more uniform interpretation and application of energy codes throughout the state. In general, the State is experiencing a true market transformation from low energy efficiency products to high energy efficiency products. These include: low solar heat gain windows, higher efficiency appliances, high efficiency air conditioners and heat pumps, increased insulation, lower thermal loss ducts and in-builder participation in “above-code” code programs such as Energy Star New Homes, which previously had no state baseline and almost no participation.

In 2011, the following savings were calculated:

- In 2011, the annual electricity savings from code-compliant residential and commercial construction is calculated to be 315,876 MWh/year (2.4% of the total electricity savings),
- Savings from residential air conditioner retrofits<sup>3</sup> is 336,046 MWh/year (2.5%).
- In 2011, the OSD electricity savings from code-compliant residential and commercial construction is calculated to be 1,361 MWh/day (3.8%),
- Savings from residential air conditioner retrofits are 2,383 MWh/day (6.6%).
- By 2013, the annual electricity savings from code-compliant residential and commercial construction is calculated to be 597,699 MWh/year (3.9% of the total electricity savings),
- Savings from residential air conditioner retrofits will be 303,281 MWh/year (2.0%).
- By 2013, the OSD electricity savings from code-compliant residential and commercial construction is calculated to be 2,462 MWh/day (5.9%),

<sup>3</sup> This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.

- Savings from residential air conditioner retrofits will be 5,230 MWh/day (12.5%).
- In 2011, the annual NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 80 tons-NOx/year (2.1% of the total NOx savings),
- Savings from residential air conditioner retrofits is 72 tons-NOx/year (2.1%).
- In 2011, the OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 0.34 tons-NOx/day (3.4%),
- Savings from residential air conditioner retrofits are 0.55 tons-NOx/day (5.6%).
- By 2013, the NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 150 tons-NOx/year (3.5% of the total NOx savings),
- Savings from residential air conditioner retrofits will be 72 tons-NOx/year (1.7%).
- By 2013, the OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 0.62 tons-NOx/day (5.4%),
- Savings from residential air conditioner retrofits will be 0.50 tons-NOx/day (4.4%).

### **Integrated NOx Emissions Reductions Reporting Across State Agencies**

In 2005, the Laboratory began to work with the TCEQ to develop a standardized, integrated NOx emissions reduction across state agencies implementing EE/RE programs so that the results can be evaluated consistently. As required by the legislation, the TCEQ receives the following reports:

- From the Laboratory – savings from code compliance and renewables;
- From the Laboratory, in cooperation with the Electric Reliability Council of Texas (ERCOT), the savings from electricity generated from wind power;
- From the Public Utilities Commission of Texas (PUCT) on the impacts of the utility-administered programs designed to meet the mandated energy efficiency goals of SB7 and
- From the State Energy Conservation Office (SECO) on the impacts of energy conservation in state agencies and political subdivisions.

The total integrated annual electricity savings for all the different programs in the integrated format was calculated using the adjustment factors shown in Table 3, for 2009 through 2020 and presented in *Table 1*. NOx emissions reduction from the electricity savings for the annual for all the programs in the integrated format is shown in Table 2.

In 2011 (see *Table 1*), the total integrated annual savings from all programs is 13,354,918 MWh/year. The integrated annual electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction is 315,876 MWh/year (2.4% of the total electricity savings),
- Savings from the PUC's Senate Bill 7 program is 1,197,953 MWh/year (9.0%),
- Savings from SECO's Senate Bill 5 program is 509,616 MWh/year (3.8%),
- Electricity savings from green power purchases (wind) is 10,995,427 MWh/year (82.3%), and
- Savings from residential air conditioner retrofits is 336,046 MWh/year (2.5%).

In 2011, the total integrated OSD savings from all programs is 36,076 MWh/day, which would be a 1,503 MW average hourly load reduction during the OSD period. The integrated OSD electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction is 1,361 MWh/day (3.8%),
- Savings from the PUC's Senate Bill 7 programs is 3,282 MWh/day (9.1%),
- Savings from SECO's Senate Bill 5 program is 1,396 MWh/day (3.9%),
- Electricity savings from green power purchases (wind) are 27,654 MWh/day (76.7%), and
- Savings from residential air conditioner retrofits are 2,383 MWh/day (6.6%).

By 2013, the total integrated annual savings from all programs will be 15,391,293 MWh/year. The integrated annual electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction will be 597,699 MWh/year (3.9% of the total electricity savings),
- Savings from the PUC's Senate Bill 7 programs will be 1,908,944 MWh/year (12.4%),
- Savings from SECO's Senate Bill 5 program will be 909,903 MWh/year (5.9%),
- Electricity savings from green power purchases (wind) will be 11,671,466 MWh/year (75.8%), and
- Savings from residential air conditioner retrofits is 303,281 MWh/year (2.0%).

By 2013, the total integrated OSD savings from all programs is 41,691 MWh/day, which would be a 1,737 MW average hourly load reduction during the OSD period. The integrated OSD electricity savings from all the different programs is:

- Savings from code-compliant residential and commercial construction is 2,462 MWh/day (5.9%),
- Savings from the PUC's Senate Bill 7 programs is 5,230 MWh/day (12.5%),
- Savings from SECO's Senate Bill 5 program is 2,493 MWh/day (6.0%),
- Electricity savings from green power purchases (wind) are 29,355 MWh/day (70.4%), and
- Savings from residential air conditioner retrofits are 2,151 MWh/day (5.2%).

In 2011 (Table 2), the total integrated annual NOx emissions reduction from all programs is 3,723 tons-NOx/year. The integrated annual NOx emissions reduction<sup>4</sup> from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction is 80 tons-NOx/year (2.1% of the total NOx savings),
- NOx emissions reduction from the PUC's Senate Bill 7 programs is 340 tons-NOx/year (9.1%),
- NOx emissions reduction from SECO's Senate Bill 5 program is 162 tons-NOx/year (4.4%),
- NOx emissions reduction from green power purchases (wind) is 3,062 tons-NOx/year (82.2%), and
- NOx emissions reduction from residential air conditioner retrofits is 79 tons-NOx/year (2.1%).

In 2011, the total integrated OSD NOx emissions reduction from all programs is 9.89 tons-NOx/day. The integrated OSD NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction is 0.34 tons-NOx/day (3.4%),
- NOx emissions reduction from the PUC's Senate Bill 7 programs is 0.93 tons-NOx/day (9.4%),
- NOx emissions reduction from SECO's Senate Bill 5 program is 0.44 tons-NOx/day (4.4%),
- NOx emissions reduction from green power purchases (wind) are 7.63 tons-NOx/day (77.1%), and
- NOx emissions reduction from residential air conditioner retrofits are 0.55 tons-NOx/day (5.6%).

By 2013, the total integrated annual NOx emissions reduction from all programs will be 4,296 tons-NOx/year. The integrated annual NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction will be 150 tons-NOx/year (3.5% of the total NOx savings),
- NOx emissions reduction from the PUC's Senate Bill 7 programs will be 547 tons-NOx/year (12.7%),
- NOx emissions reduction from SECO's Senate Bill 5 program will be 277 tons-NOx/year (6.4%),
- NOx emissions reduction from green power purchases (wind) will be 3,250 tons-NOx/year (75.7%), and
- NOx emissions reduction from residential air conditioner retrofits will be 72 tons-NOx/year (1.7%).

By 2013, the total integrated OSD NOx emissions reduction from all programs is 11.48 tons-NOx/day. The integrated OSD NOx emissions reduction from all the different programs is:

- NOx emissions reduction from code-compliant residential and commercial construction will be 0.62 tons-NOx/day (5.4%),

<sup>4</sup> These NOx emissions reductions were calculated with the US EPA's 2010 eGRID for annual (25% capacity factor).



- NOx emissions reduction from the PUC's Senate Bill 7 programs will be 1.50 tons-NOx/day (13.1%),
- NOx emissions reduction from SECO's Senate Bill 5 program will be 0.76 tons-NOx/day (6.6%),
- NOx emissions reduction from green power purchases (wind) will be 8.10 tons-NOx/day (70.6%), and
- NOx emissions reduction from residential air conditioner retrofits will be 0.50 tons-NOx/day (4.4%).

Figure 2 shows the NOx emissions reduction through 2020 for the electricity and natural gas savings from all TERP programs reporting to the TCEQ. Table 3 provides the details regarding the annual degradation, transmission and distribution losses, discount factors and growth factors that were used in the analysis<sup>5</sup>. Additional details of the analysis are reported in Volume III of this report.

Table 3: Adjustment Factors used for the Calculation of the Annual and OSD NOx Savings for the Different Programs

	ESL-Single Family	ESL-Multi Family	ESL-Commercial	PUC (SB7)	SECO	Wind-ERCOT	SEER13 Single Family	SEER13 Multi Family
Annual Degradation Factor	2.00%	2.00%	2.00%	5.00%	5.00%	0.00%	5.00%	5.00%
T&D Loss	7.00%	7.00%	7.00%	7.00%	7.00%	0.00%	7.00%	7.00%
Initial Discount Factor	20.00%	20.00%	20.00%	25.00%	60.00%	10.00%	20.00%	20.00%
Growth Factor	3.25%	1.54%	3.25%	0.00%	0.00%	Actual Rates	N.A.	N.A.
Weather Normalized	Yes	Yes	Yes	No	No	See note 7	Yes	Yes

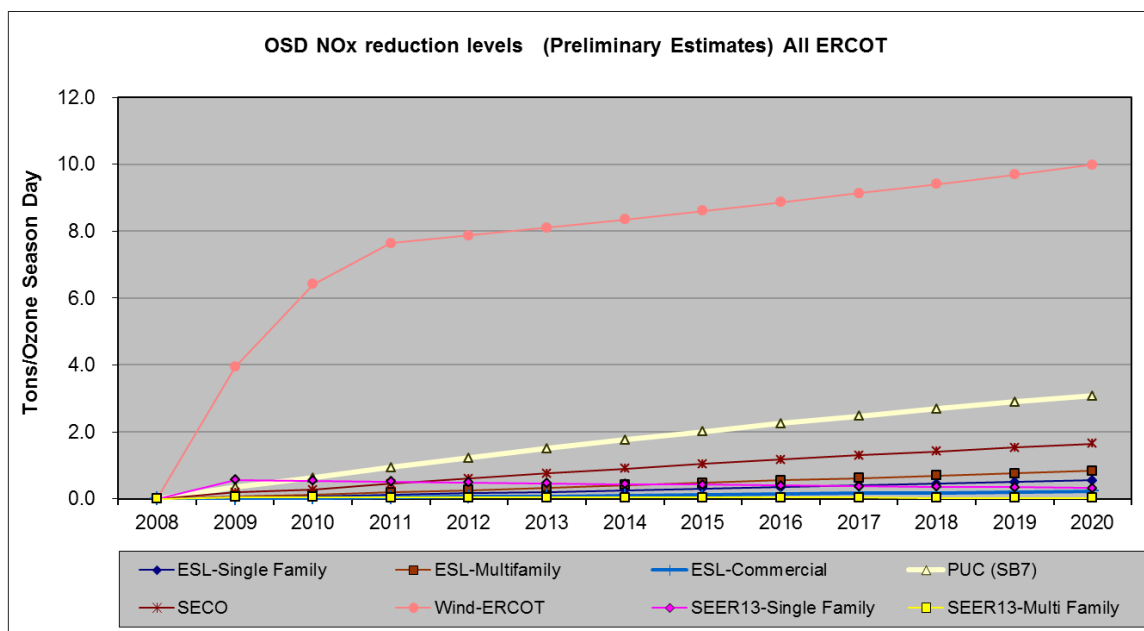


Figure 2: Integrated OSD NOx Emissions Reduction Projections through 2020 (Base Year 2008)

### Technology for Calculating and Verifying Emissions Reduction from Energy Used in Buildings

<sup>5</sup> These factors were determined by TCEQ.

In 2004 and 2005, the Laboratory developed a web-based Emissions Reduction Calculator, known as “*eCalc*,” which contains the underlying technology for determining NO<sub>x</sub> emissions reduction from power plants that generate the electricity for the user<sup>6</sup>. The emissions reduction calculator is being used to calculate emissions reduction for consideration for SIP credits from energy efficiency and renewable energy programs in the TERP.

In 2007, the Laboratory enhanced the calculator to provide additional functions and usability, including:

- Renaming the product IC3 v2.0
- Enhanced the Laboratory’s IECC/IRC Code-Traceable Test Suite for determining emissions reduction due to code and above-code programs;
- Enhanced web-based emissions calculator, including:
  - Use of the calculator to determine 15% above code residential and commercial options.
  - Gathered, cleaned and posted weather data archive for 17 NOAA stations;
  - Performed comparative testing of the calculator vs. other, non-web-based simulation programs;
  - Developed and tested radiant barrier simulation;
  - Using the web-based emissions calculator, started development of the derivative version Texas Climate Vision calculator for the City of Austin;
- Continued the development of verification procedures, including:
  - Completed the calibrated simulation of a high-efficiency office building in Austin, Texas;
  - Continued work to develop a calibrated simulation of an office building in College Station; and
  - Continued work to develop a calibrated simulation of a K-12 school in College Station;

In 2008, work on both web based calculators continued;

- Deployed IC3 v3.2 to handle a wider selection of single family building configurations (<http://ic3.tamu.edu>);
- Delivered TCV v1.0 to the City of Austin for their testing;
- Continued to operate the original eCalc;
- Supported modeling efforts by building enhanced tools for batch simulation;
- Provided training on both IC3 and TCV.

In 2009, IC3 developments included:

- A sister product, AIM was created for the State Comptroller’s office.
- Usage statistics continue to climb.
- Updated to v3.6 which included 3 story houses, external cladding, more sophisticated ceiling/roof models, enhanced foundation modeling and the ability to copy projects

In 2010 there were several software updates including:

- IC3
  - 3.9.0 – Slab Insulation Support
  - 3.7.0 – 3.8.0 First Version of Multifamily Released along with numerous tweaks and fixes
  - 3.6.2 – New Building Model Integrated, Updated Artwork and Illustrations
- DDP
  - 1.7.05 – Added Heat Reject Recording for Electric and Gas
- Web Reports and Texas Building Registry
  - Registry 0.x – First versions of the Web Reports on TCV, eCalc, and IC3
  - Registry 1.0 – City and County Reports
  - Registry 1.1 – Cross-linked Reports for City and County
  - IC3 Reports 1.0 – Updated Certificate Reports which replace Registry 1.1 and evolve into the Texas Building Registry

The 2011 software updates include:

- IC3

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<sup>6</sup> eCalc reports NO<sub>x</sub>, SO<sub>x</sub> and CO<sub>2</sub> emissions reduction from the US EPA eGRID database for power providers in the ERCOT region.

- 3.9.4 – Added approval workflow to start a new 2009 IECC job as further refinements were needed to the BDL
- 3.9.5 – Various IECC 2009 fixes and refinements implemented
- 3.9.6 – Updated BDL to 4.01.08, SHGC max does not apply to Climate Zone 4, 0.35 ACH minimum to all projects, Ventilation Fans added to % Air Conditioning Calculation
- 3.9.7 - Corrected Certificate and Status screens to reflect insulation and floor construction.
- 3.9.8- Set minimum R-value for insulated sheathing to R-2;
- 3.10.0 - Updated and corrected problems with several text and value fields; Corrected and printed MF and SF Certificates;
- 3.10.3 - Changed Certificate to Energy Audit Report; Added a new Certificate to be printed out; Added Inspector's list for a project; Added Pagination in projects page
- 3.11.0 12/22/2011-Added Austin Energy 2009 IECC Energy Code Support
- Web Reports and Texas Building Registry
  - TBR Reports 1.0.5 – Added 4 new reports
  - TBR Reports 1.0.6 – Added 9 new reports
  - Registry 2.0 – Included 7 new Parameterized reports

### **Planned Focus for 2012**

In FY 2011, the Energy Systems Laboratory will continue in its cooperative efforts with the TCEQ, PUCT, SECO, US EPA and others to evaluate the energy savings resulted from the EE/RE measures and programs of the TERP and their impact on air quality, and continue with the energy code state-wide implementation assistance under the Texas Building Energy Performance Standards program of the TERP. The Laboratory team will:

- Assist the TCEQ to obtain SIP credits from energy efficiency and renewable energy using the Laboratory's Emissions Reduction Calculator technology;
- Verify, document and report energy efficiency and renewable energy savings in all TERP EE/RE programs for the SIP in each non-attainment and affected county using the TCEQ/US EPA approved technology;
- Assist the PUCT with determining emissions reductions credits from energy efficiency programs funded by SB 7 and SB 5;
- Assist political subdivisions and Councils of Governments with calculating emissions reductions from local code changes and voluntary EE/RE programs for SIP inclusion;
- Continue to refine the cost-effective techniques to implement 15% above code (2009 IECC) energy efficiency in low-priced and moderately-priced residential housing;
- Continue to refine the cost-effective methods and techniques to implement 15% above code energy efficiency in low-priced and moderately-priced commercial buildings;
- Continue to develop creditable procedures for calculating NOx emissions reductions from green renewable technologies, including wind power, solar energy and geothermal energy systems;
- Continue development of well-documented, integrated NOx emissions reductions methodologies for calculating and reporting NOx reductions, including a unified database framework for required reporting to TCEQ of potentially creditable measures from the ESL, PUCT, and SECO SB 5 initiatives;
- Upon request, provide written recommendations to the State Energy Conservation Office (SECO) about whether or not the energy efficiency provisions of latest published edition of the International Residential Code (IRC), or the International Energy Conservation Code (IECC), are equivalent to, or better than, the energy efficiency and air quality achievable under the editions adopted under the 2001 IRC/IECC. This will consider comments made by persons who have an interest in the adoption of the energy codes in the recommendations made to SECO.
- Develop a standardized report format to be used by providers of home energy ratings, including different report formats for rating newly constructed residences from those for existing residences.

- Continue to cooperate with an industry organization or trade association to: develop guidelines for home energy ratings; provide training for individuals performing home energy ratings and providers of home energy ratings; and provide a registry of completed ratings for newly constructed residences and residential improvement projects for the purpose of computing the energy savings and emissions reductions benefits of the home energy ratings program.
- Include all benefits attained from this program in an annual report to the commission.
- Enhance IC3 to support multifamily residences, and add other features to enhance adoption.
- Engage production builders and municipalities in overcoming obstacles to their using IC3 for their new home construction.
- Seek funding to enhance TCV (Austin's version of IC3). Assist SECO in refining the form on which political subdivisions need to report annually their electric consumption.
- Assist SECO in developing a new standardized reporting form for all municipally owned utilities and electric cooperatives, which had retail sales of more than 500,000 MWh in 2005, to report the combined effects of their energy efficiency activities from the previous calendar year.
- Send a representative to SECO's new advisory committee for selecting high-performance building design evaluation systems.

The Laboratory has and will continue to provide leading-edge technical assistance to counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP.

If any questions arise, please contact us by phone at 979-845-1280, or by email at [terpinfo@tees.tamus.edu](mailto:terpinfo@tees.tamus.edu).